Teaching Statement

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Good teaching does not only transfer knowledge, it creates intellectual community. At the university level the community component is particularly important, since professors are cultivating future colleagues. In a poorly-taught classroom, information flows only from teacher to student, assessment functions to separate "good" students from "bad", and the students' motivation is taken for granted. In a classroom built on intellectual community, the teacher actively seeks feedback from the students and encourages the students to mentor one another, assesment allows students to monitor their own progress and for the teacher to assess their own teaching, and the teacher works to contextualize the material within the students' interests.

I have been teaching throughout my adult life, and my experience has taught me both how to create community and why it is valuable.

- I worked as a university-level teaching assistant both as an undergraduate in engineering and, as as a PhD student, for the graduate-level applied statistics course. I received a university teaching award for my teaching in the latter.
- I was a full-time teacher for two years at the middle and elemenatary school level as a Peace Corps volunteer in Kazakhstan teaching math and English as a second language (ESL). For my core class, I wrote a math textbook in simple English for ESL students. During the Peace Corps, I also organized multiple extracurricular classes for my community in math, music, including classes in pedagogy for Kazakhstani teachers of ESL.
- As a PhD student, I volunteered for a year and a half teaching math courses to inmates at San Quentin prison with the Prison University Project (PUP).

Futhermore, many of my other professional activities, though not explicitly in a classroom, have had a teaching component. In these activities, community-based thinking — two-way communication, non-judgemental feedback, and the cultivation of intrinsic motivation — is as valuable as in the classroom.

- I have acted as a formal and informal mentor to numerous PhD students, both as part of the student mentorship program at UC Berkeley and as a postdoctoral researcher at MIT. At Google, I acted as an official mentor for several junior engineers and was the technical lead for a small research team.
- For most of my PhD, I organized and conducted my own reading group for any interested students on topics including variational Bayes, Bayesian nonparametrics, differential geometry, the bootstrap, and functional analysis.
- I participated in the UC Berkeley statitsical consulting class, provided statistical consulting as a fellow in the Berkeley Institute of Data Science, and consulted professionally, including participating for several years in Berkeley's chapter of the National Security Agency Statistical Advising Group (NSASAG).

For the remainder of the essay, I will describe instances when I was able to enact the community-based practices of two-way communication, non-judgemental feedback, and the cultivation of intrinsic motivation.

Cultivate intrinsic motivation. During my second year as a PhD student at UC Berkeley I was asked by Prof. Bin Yu to be her teaching assistant for the graduate-level course in applied statistics. The course was organized around a number labs using real-life datasets, and my reponsibilties were to give weekly lectures, hold office hours, and grade the written labs. In addition, Prof. Yu asked me to add a reproducible research component to the course based on my experience at Google, to which end I incorporated Github, code readbility, and unit testing into the lab requirements.

I quickly realized that simply teaching code readability and making it a component of the grade was insufficient. At Google, you cannot submit changes that violate readability standards, but, in the class, not a single student was carefully following readability guidelines in their submitted code. The students — who were otherwise very highly motivated — simply did not see the importance of readability enough to change bad habits. To address this, I designed

an in-class exercise in which the students had to "reproduce" a simple analysis written by me. In my code, I deliberately and systematically violated all the code readbility guidelines I was trying to teach and, as a result, it was quite difficult to understand what my analysis was doing. To sweeten the pot, I put a small but meaningful error in the code and challenged the students to find it. The students loved the puzzle-solving aspect of the assignment and, to my delight, spent much of the hour complaining about my terrible style. Following this assignment, the labs' code readability improved considerably.

Evaluate productively. Evaluating students' performance is a part of every classroom, but its role in a community-based classroom is ideally productive and as non-threatening as possible.

Evalaution should allow a teacher to motivate and get feedback from students at all levels from the most to least accomplished. When I taught an introductory statistics class at San Quentin University through the Prison University Project (PUP), the students came from vastly different math backgrounds — some had been top students when they were younger, some had only learned to read as adults through PUP. To help accomodate the range of abilities and needs, I reduced the proportion of the class devoted to lectures and increased the time available for individual or group work while I walked around and answered questions. I would design the problem sets with the expectation that *no* student would be able to complete the whole thing in the time allotted, so that the faster students could quickly proceed to more challenging problems, the slower students could spend more time at their level, and (hopefully) nobody would feel either bored or discouarged. When I found the same question was being asked repeatedly, I would bring everyone together for a brief lecture on the question, and then return to individual work. In this way, I was able to create a classroom environment that accomodated everyone.

Useful evaluation is frequent, transparent, and conducted via many modalities. When I taught in the Peace Corps, at PUP, and at UC Berkeley, as much as possible I compute students' grades from many small projects rather than a few large ones, let the students monitor their own progress, and based the grade on many different modes of performance, including in-class participation, homework, exams, and group work. In this way, struggling students can ask for help early and feel empowered to improve their grade; in the applied statistics course I helped teach at UC Berkeley, some of the students who began with the weakest backgrounds went on to become some of the strongest students through frequent feedback and a lot of one-on-one help in office hours.

Encourage multi-way communication. A teacher can learn from the students whether their teaching is effective, and can even often gain valuable insights themselves when students interpret material in new ways.

It is crucial that a good teacher have a written lesson plan, and just as crucial that they check regularly that students are keeping up with it. For example, most technical lectures have many points at which minor inferential steps can be made into a short, minute-long exercise. I build in explicit pauses for the students to work out such exercises, which both requires the students to remain actively engaged and can reveal if the exposition is going too quickly. Similarly, I find short, low-stakes, written in-class quizzes at the beginning of class to be particularly effective at checking in on students.

Statistical consulting is another venue in which two-way communication is particularly important. Rarely, I have found, does a petitioner actually ask a useful statistical question at first, and a statistical consultant provides the most value by first listening carefully to the problem details. For example, as part of the NSASAG, we were asked how to compute low-rank approximations of matrices with some given statistical properties. Upon being asked for the motivation, we learned that all that was actually needed was the computation of a t-statistic based on a linear form of a high-dimensional parameter, which I saw could be computed exactly using the conjugate gradient algorithm with no recourse to low-rank approximations.